

Chris Whelan

Henkel, Engineered Wood Adhesives

PELICE 2016 Atlanta, Georgia



Adhesive Technology Drives Mass Wood Innovation

LOCTITE - Purbond®

Adhesives for Modern Timber Construction
Klebstoffe für den modernen Holzhau



Excellence is our Passion

Who is Henkel

- Founded 1876
- Family controlled
- World's largest adhesive manufacturer
- 48,000 Employees
- 169 manufacturing and 17 R&D sites



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2

Adhesive Technologies

Five Business Segments

**Packaging
and
Consumer
Goods
Adhesives**



**Transport
and
Metal**



**General
Industry**



**Electronics
Materials**

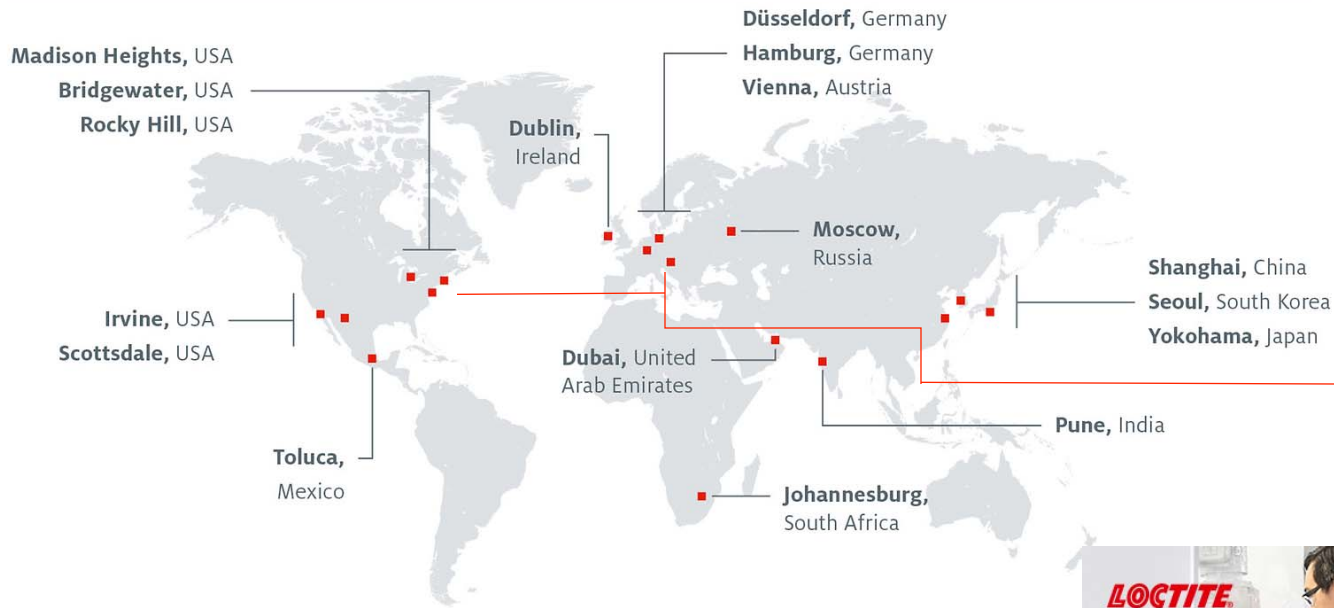


**Consumer,
Craftsmen
and
Building**



The opportunities for innovative wood construction are here today.....

Selected research and development sites



...made possible, in part, through advancements in adhesive bonding, but also, an adhesive company with the depth, knowledge and resources to help support customers and Industry Innovate.



Engineered Wood Center of Competence
Global Certification support and North American Wood Lab

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Past Presentation Topics over last 10 years in North America

History of Moisture Curing Polyurethane	✓
Certification for Structural use Europe	✓
Certification for Structural use North America	✓
Fire Performance	✓
Moisture Durability	✓
Process Advantages	
End use Advantages	
Market Advantages	

Traditional Structural Adhesives and Mass Wood Elements

- Open time driven by coating weight
 - 50 to 100lbs per 1000 sq ft
- Open time influenced by plant temperature
 - Minimum press/plant temperature 70-80F for reasonable set speed
 - 90F to 100F max plant temperature @ 100lbs per 1000² ft
- Long cold press time
 - 6-8 hours pressing at 70-80F ambient
 - Longer press time for lower plant temperature
 - Approx. 2824³ ft per 7.5 hour shift (80³ M)
- RF pressing long and required high power
 - Presses typically 15± feet long, so multiple press cycles required
- Two component
 - Security of mix
 - Large glue head containing mixed adhesive

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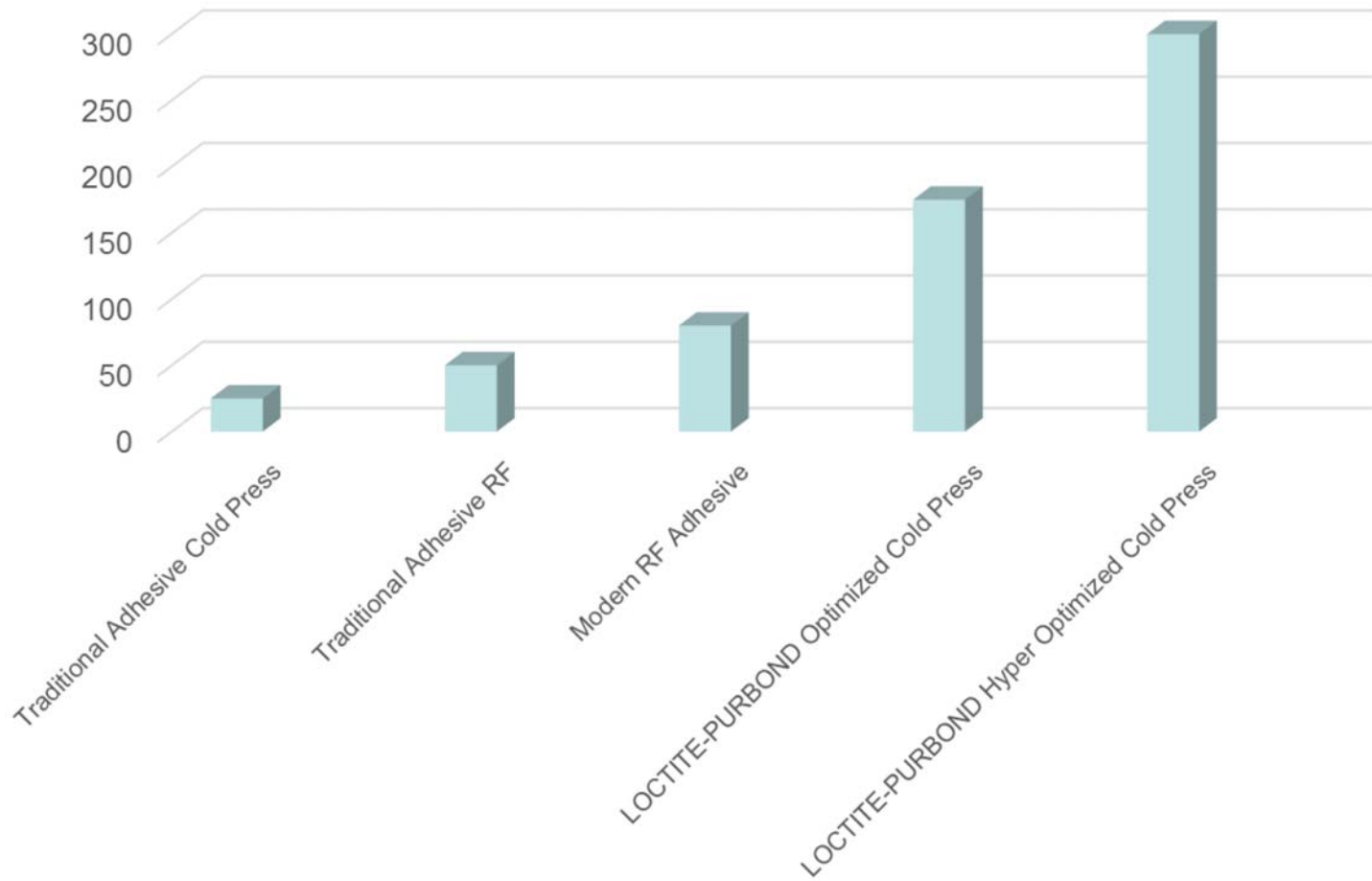


LOCTITE - Purbond[®] Structural Adhesives and Mass Wood Elements

- Open time is formulated to match production requirement
 - Minimally influenced by ambient conditions
 - Typical operating range 60F to 100+F
 - Coating weight is constant, typically 26lbs per 1000 sq ft
- Press time is constant, and minimally influenced by ambient conditions
 - Typical ambient pressing range 60F to 100+F
 - Press time is 2.5 times open time
- Composition efficiency is key
 - Efficient or automated composition is key to high output
 - Optimized flow through press system can produce up to 7229³ft (204³M)/7.5hrs
- No Formaldehyde or solvents
 - Safe and pleasant work environment, ecologically compliant finished element

LOCTITE - Purbond® Structural Adhesives and Mass Wood Elements CLT

M³ Maximum Production per 7.5hr



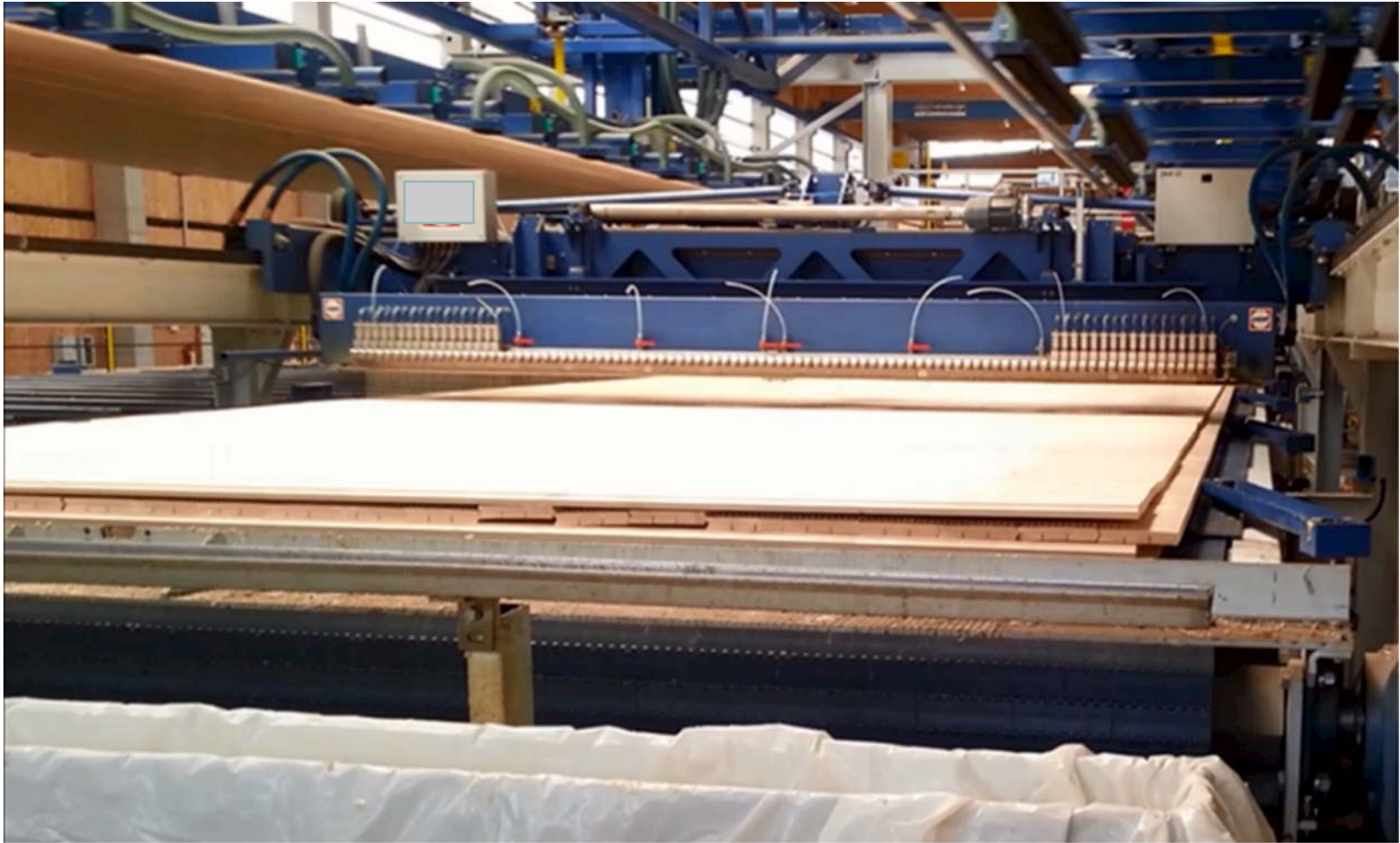
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Why Massive Timber now?

- **LOCTITE-Purbond®** Opened up the ability to produce massive bonded wood elements economically and ecologically



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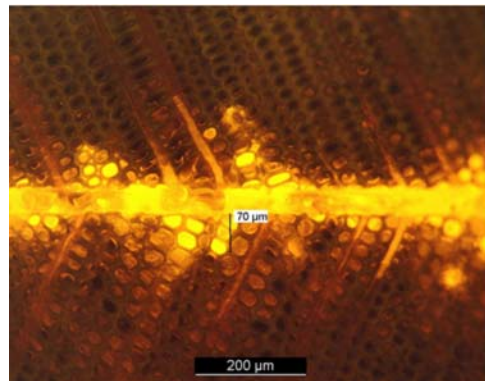
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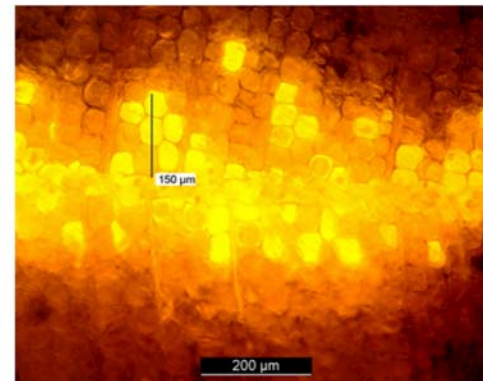
Why Massive Timber now?

- **LOCTITE-Purbond®** is 100% solids, and **chemically reacts with wood cellulose and lignin** effecting a unique bonding interphase, adding no moisture to finished wood element.

Adhesion is the state in which two surfaces are held together by interfacial forces, which may be valence forces, interlocking action, or both.*



Interlocking action, also called mechanical bonding, means surfaces are held together by an adhesive that has penetrated the porous surface while it is liquid, then anchored itself during solidification.*



.Valence forces are forces of attraction produced by the interactions of atoms, ions, and molecules that exist within and at the surfaces of both adhesive and adherend.*

*Forest Products Lab Wood Handbook

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Why Massive Timber now?

- **LOCTITE-Purbond®** bond is more wood like in density, and with the Interphase adhesion tends to move with the wood vs traditional, Interface bonds.

Interface Adhesive

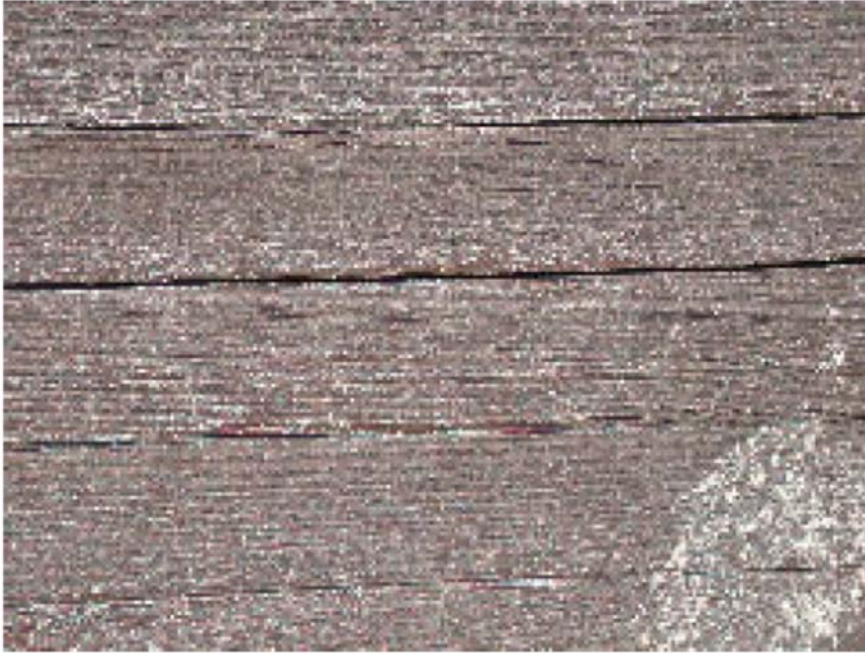


Photo 15: Detail; cracks are running in vicinity of the bond line

LOCTITE-Purbond®



Photo 17: Detail view of gluelam beam

*EMPA Swiss Federal Laboratories

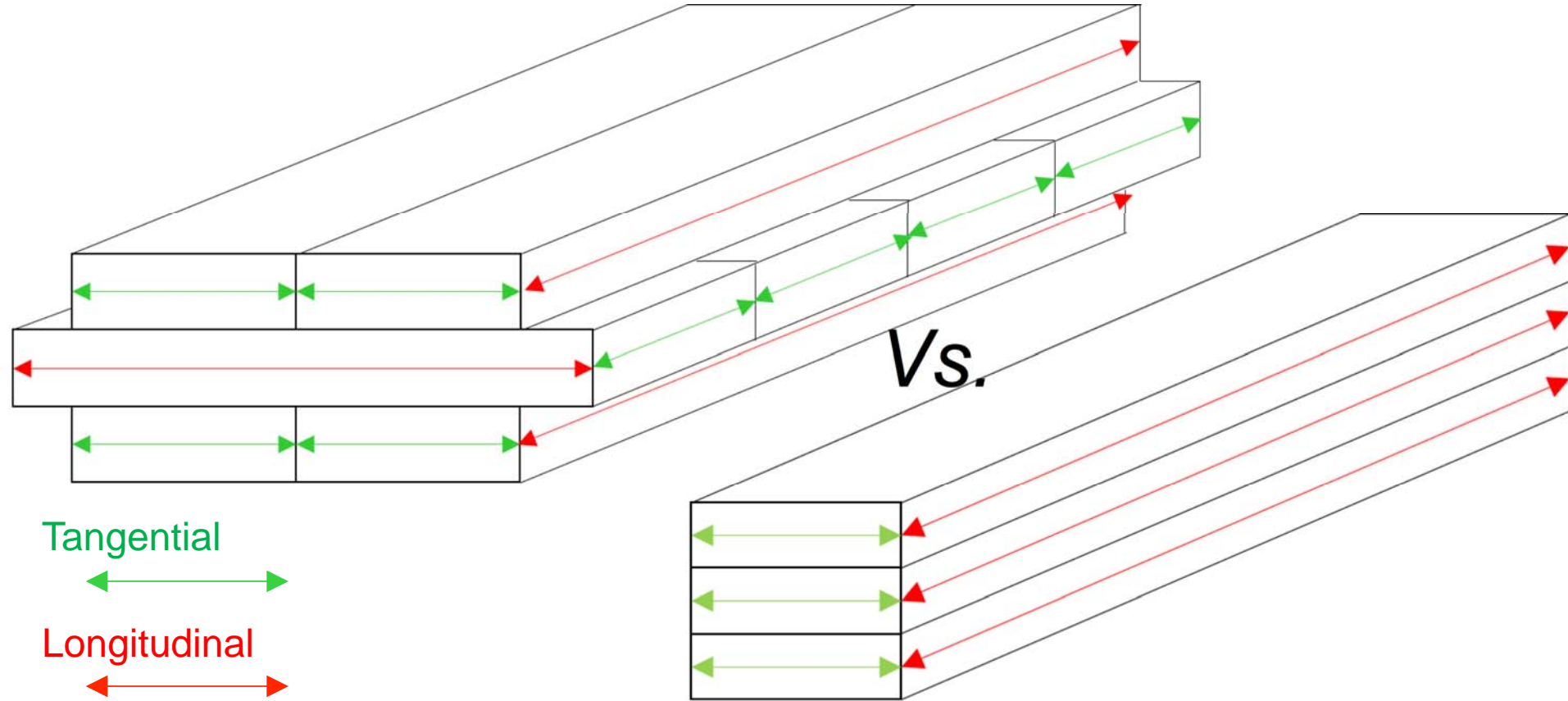
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Why Massive Timber now?

- **LOCTITE-Purbond®** Provides ductile bonds that work with the wood, especially with cross grain applications.



Tangential movement vs. Longitudinal movement can be up to 1% different over a 2% change in moisture

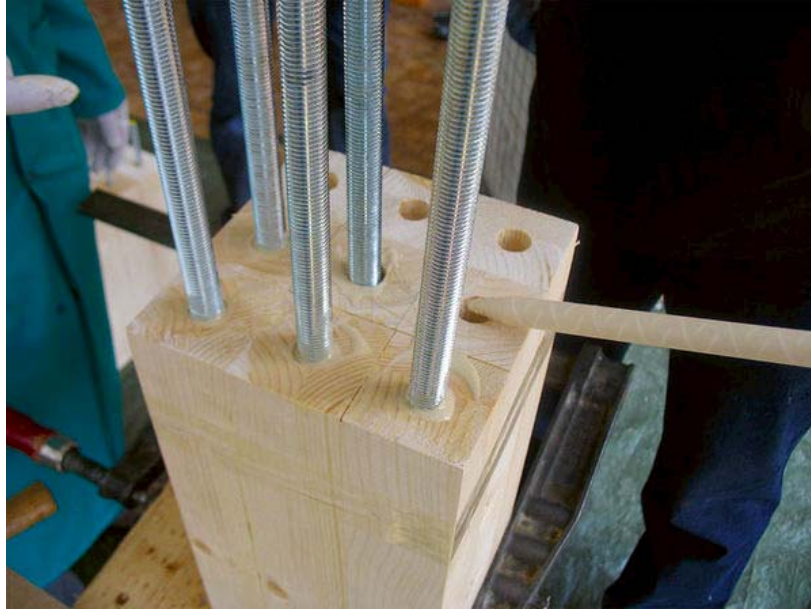
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Why Massive Timber now?

2K Polyurethane adhesives for mechanical connections...



LOCTITE - Purbond® CR421 Polyurethane resin
for Advanced wood to mechanical connector Bonding

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Healthy building material

Healthy work environment

Healthy adhesive choice

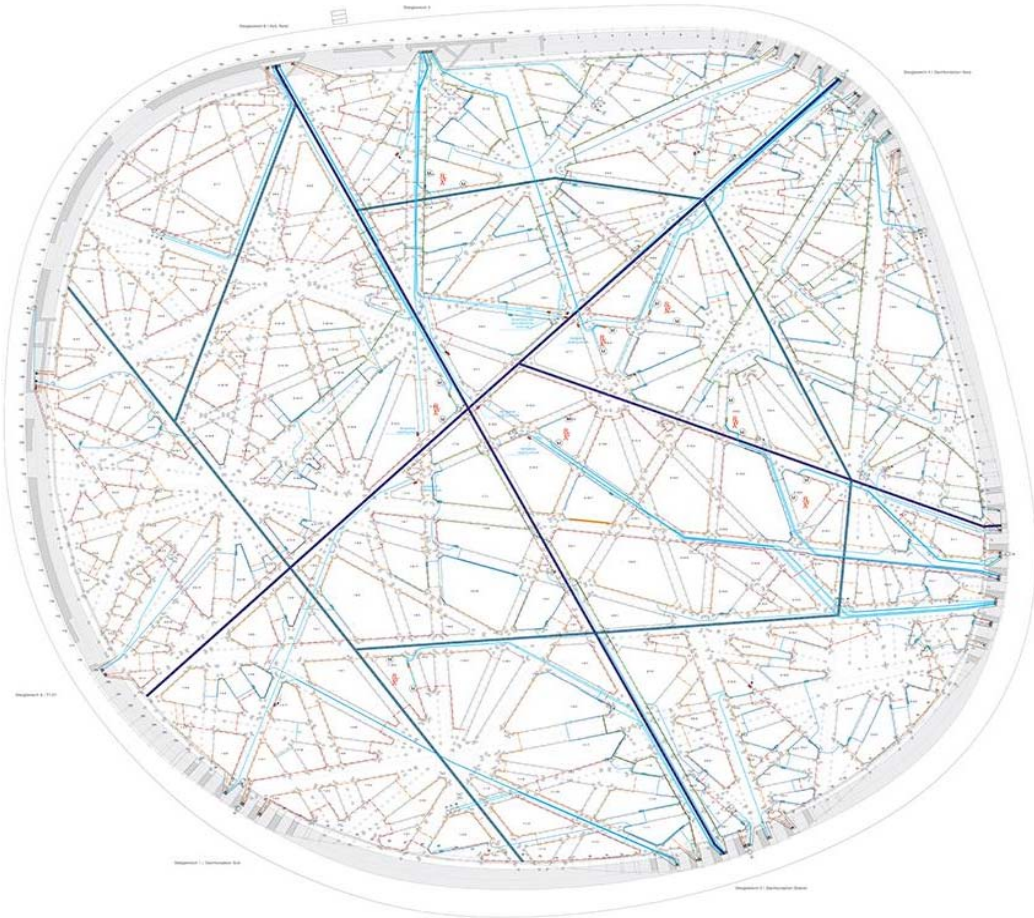
Healthy Buildings



LOCTITE - Purbond®

Done Economically

Imagine.....



Imagine...A free span roof structure

Imagine...270 window openings

Imagine...Windows shaped like
opening in a tree canopy

Imagine...This structure made from
wood

Then

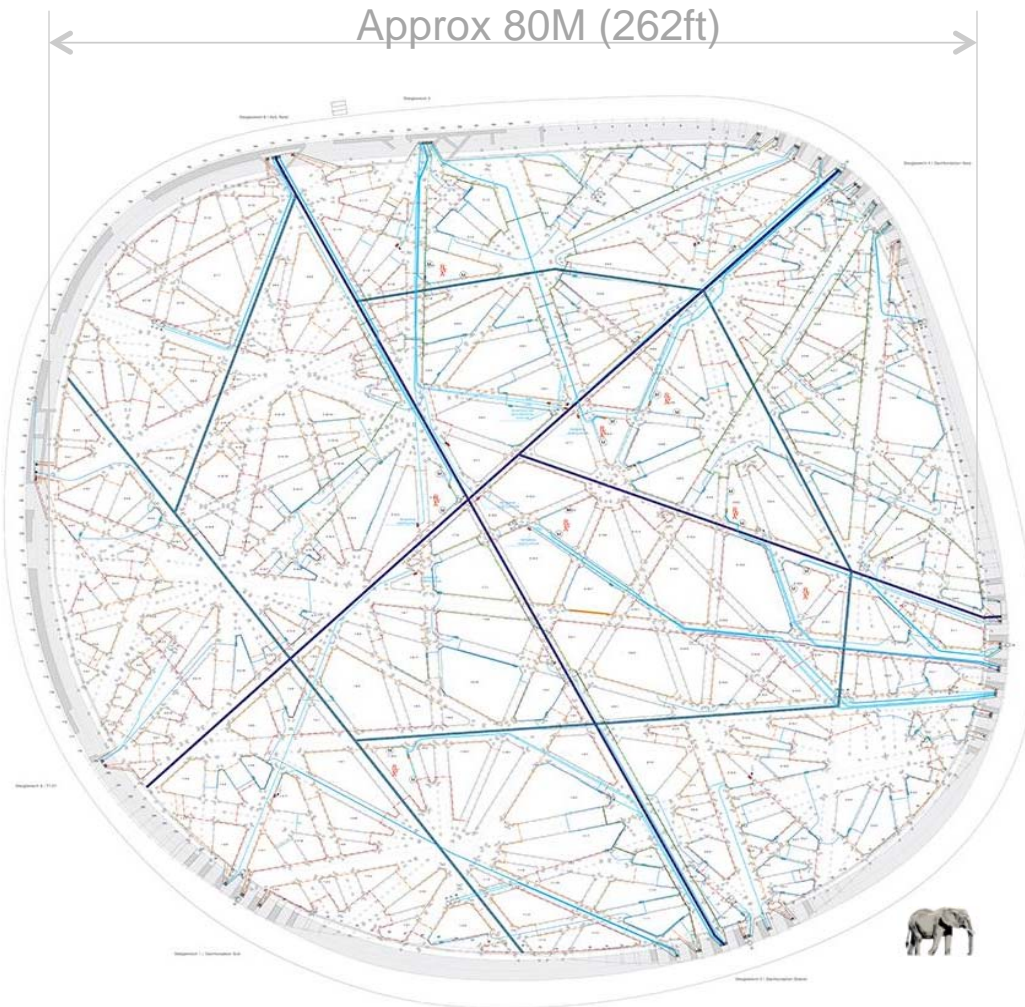
Imagine...This structure covering
1.68 acres

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Case study – Elephant House – Zurich Zoo, Switzerland



- 73194 sq ft
 - No interior support
- 262 ft free span
- 2.2 million lbs of CLT
- 600 pieces 3 layer CLT panels
- CLT engineered like beams but with compression and tension in multiple directions.
- Free form appearance with a significant portion as windows

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Library in Vennesla, KLH



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Library in Vennesla, KLH



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UBC Okanagan Campus, Fitness Center, Structurlam



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UBC Okanagan Campus, Fitness Center, Structurlam

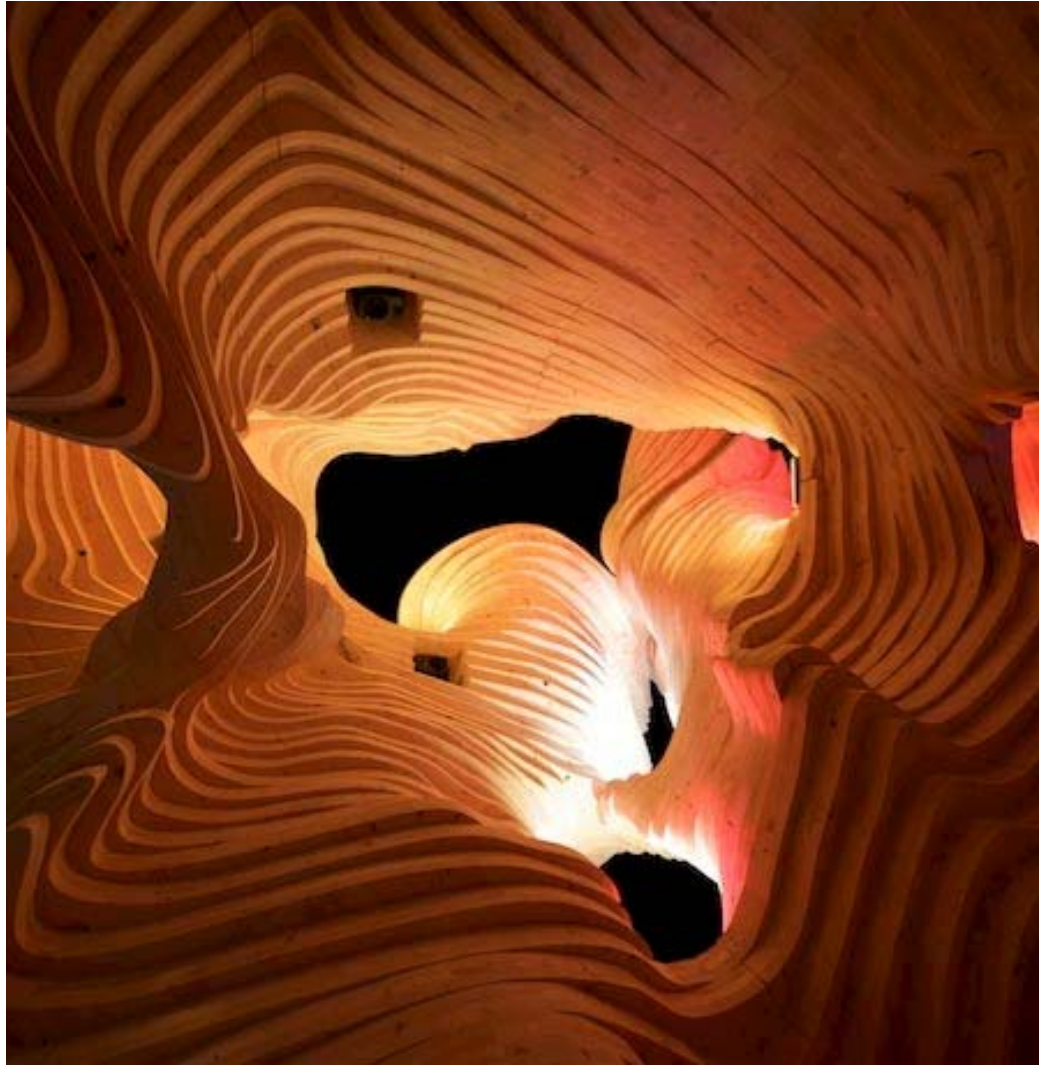


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Termite Pavilion, London England, KLH



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Multi family community Via Cenni, Milan, IT



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Ultra Moderne, Chicago Horizon, Chicago, Nordic Engineered Wood



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Jubilee Plaza, Fort McMurray BC, Structurlam



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Timber tower, Hanover, Germany



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Penobscot Bay Cabins, CLT platforms,



Image courtesy of Fine Homebuilding Magazine

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Why Massive Timber now?

- **LOCTITE-Purbond®** Does not introduce Formaldehyde or Solvents to the work place or the final elements.



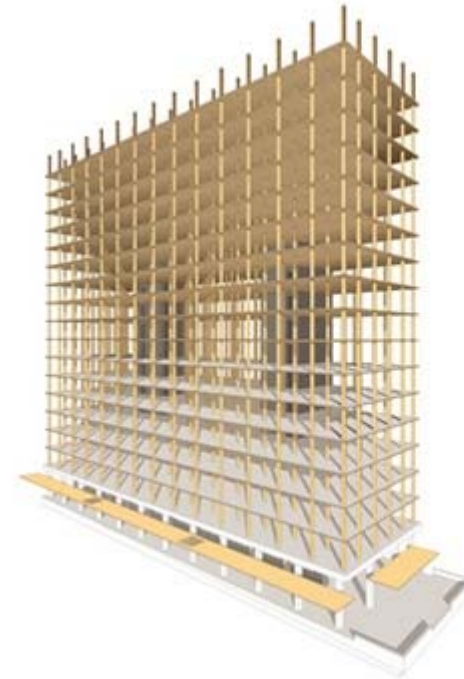
Ronald McDonald House For Sick Children, Vancouver, BC
CLT, Structurlam, Adhesive **LOCTITE-Purbond®**

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18 Story Wood High Rise, Vancouver BC, Worlds tallest



CLT floor slab with
glulam columns and
steel connector



partial encapsulation
during construction



completed construction

Congratulations on the start of this exciting project!

CLT by Structurlam, Adhesive **LOCTITE** HB E202 **PURBOND**

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The future of CLT and Mass timber?



Concrete house left standing after Hurricane Katrina

We can make safe, durable structures with CLT and Mass Timber, TODAY

That everyone can build and afford, so more than one house is left standing.

Thank You!

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